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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte HONG JIANG, BAL SANKPAL, STEVEN THOMAS, and TIMOTHY ALLEN

Appeal 2008-2092
Application 10/774,805
Technology Center 3600

Decided:[1] February 13, 2009

Before: JENNIFER D. BAHR, STEVEN D.A. McCARTHY, and STEFAN STAICOVICI, *Administrative Patent Judges*.

BAHR, *Administrative Patent Judge*.

DECISION ON APPEAL

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[1] The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, begins to run from the decided date shown on this page of the decision. The time period does not run from the Mail Date (paper delivery) or Notification Date (electronic delivery).

STATEMENT OF THE CASE

Hong Jiang et al. (Appellants) appeal under 35 U.S.C. § 134 from the Examiner's decision rejecting claims 1-9 and 17-19. Claims 10-16 and 20-32, the only other pending claims, have been withdrawn from consideration. We have jurisdiction over this appeal under 35 U.S.C. § 6 (2002).

The Invention

Appellants' claimed invention is directed to a system and method for controlling a clutch in a transfer case by operating the clutch partially engaged, while avoiding excess heat accumulation in the clutch. Specification 3:8-12. Claims 1 and 17, reproduced below, are illustrative of the claimed subject matter.

> 1. A method for controlling a clutch that driveably connects an input and an output, the method comprising the steps of:
>
> producing input torque at the clutch;
>
> operating the clutch partially engaged;
>
> calculating the temperature of the clutch;
>
> establishing a reference clutch temperature;
>
> comparing the calculated clutch temperature and reference clutch temperature; and
>
> if the calculated clutch temperature equals or exceeds the reference clutch temperature, then increasing the degree of clutch engagement sufficiently to reduce the calculated temperature of the clutch.

> 17. In a transfer case having first and second outputs, a system for controlling a clutch that driveably connects the first output and second output, comprising:

means for operating the clutch partially engaged;

means for calculating the temperature of the clutch;

establishing a reference clutch temperature;

means for comparing the calculated temperature of the clutch and reference clutch temperature; and

means for producing an output signal for increasing the degree of clutch engagement sufficiently to reduce the calculated temperature of the clutch, if the calculated temperature of the clutch equals or exceeds the reference clutch temperature.

The Rejections

Appellants seek review of the Examiner's rejections of claims 1 and 17-19 under 35 U.S.C. § 102(b) as being anticipated by Maguire (US 6,095,946, issued August 1, 2000) and claims 1-9 and 17-19 under 35 U.S.C. § 103(a) as being unpatentable over Salecker (US 6,006,149, issued December 21, 1999) and Maguire.

SUMMARY OF DECISION

We AFFIRM-IN-PART.

OPINION

The Anticipation Rejection

Appellants argue that Maguire does not teach increasing the degree of clutch engagement sufficiently to reduce the calculated temperature of the

clutch, if the calculated clutch temperature equals or exceeds the reference clutch temperature, as called for in independent claims 1 and 17, and thus does not anticipate the claimed subject matter. Appeal Br. 6, 7, 8, and 9. Accordingly, the threshold issue in this appeal is whether Maguire teaches this feature.

Other issues raised in contesting the anticipation rejection are whether Maguire teaches comparing a calculated clutch temperature with a reference temperature, as called for in claims 1 and 17, and a transfer case, as called for in claim 17.

Facts Pertinent to the Anticipation Rejection

FF1 Maguire's invention relates to fluid operated friction torque transmitting mechanisms, such as a clutch 18 in a transmission also comprising a conventional planetary gear arrangement 20 and electro-hydraulic control 22. Maguire, col. 1, ll. 6-8; col. 2, ll. 50-54.

FF2 Maguire's clutch 18 comprises friction discs or steel plates and a fluid operated piston for enforcing engagement between the discs or plates. Maguire, col. 3, ll. 1-6.

FF3 Maguire describes a friction device having discs or plates alternately connected between an input structure, such as a shaft, hub, or gear, and an output structure, such as a shaft, hub, or gear, to establish a drive ratio between the transmission input and output. Maguire, col. 1, ll. 14-22. Maguire does not explicitly teach a transmission having first and second outputs.

FF4 Maguire teaches that friction resulting from clutch slip (relative slipping between discs) during the slipping portion of the engagement

cycle causes an increase in disc temperature. Maguire also teaches cooling the discs by fluid flow when the discs are completely engaged or disengaged. Maguire, col. 3, ll. 12-21.

FF5 Maguire's electro-hydraulic control 22 includes a CPU that controls, *inter alia*, solenoid valves, some of which control the engagement and disengagement of the friction mechanisms, and the maximum engagement pressure in the friction devices. Maguire, col. 3, ll. 43-62.

FF6 Maguire teaches sensing or calculating the present temperature of each friction device. Maguire, col. 4, ll. 3-6. If a shift (i.e., the engagement of one friction device and the simultaneous disengagement of another device, which may be an upshift or a downshift) is requested, Maguire's CPU calculates the heat energy that will be transmitted during such a shift and the resultant expected friction device temperature at the end of the shift. Maguire, col. 1, ll. 23-29; col. 4, ll. 7-29. If the algorithm carried out by the CPU determines that the friction device temperature will exceed the design limit (reference temperature), the algorithm determines adaptive values for, *inter alia*, shift times, such that the shift will not result in a temperature increase above the design limit. Maguire, col. 4, ll. 30-39. In accordance with the adaptive measures initiated by the algorithm in the event that the calculated temperature will exceed the design limit, Maguire teaches making the shift with "increased apply pressure at the friction device." Maguire, col. 4, ll. 43-44. In other words, Maguire teaches increasing the degree of engagement

sufficiently to reduce the temperature rise during the shift, so that the shift will not result in a temperature increase above the design limit.

FF7 As described by Appellants, "[a] transfer case is a device located in a motor vehicle drive line between the output of a geared power transmission and front and rear driveshafts for transmitting power to the wheels." Specification 1:12-14.

Analysis

The above facts (FF5 and FF6 in particular) show that Maguire does teach increasing the degree of clutch engagement sufficiently to reduce the calculated temperature of the clutch, if the calculated clutch temperature equals or exceeds the reference clutch temperature, as called for in independent claims 1 and 17. Appellants' argument to the contrary thus is not persuasive.

Appellants additionally argue that Maguire does not disclose mutually comparing the current clutch temperature and a reference temperature. Appeal Br. 7 and 9. This argument is not persuasive, because claims 1 and 17 do not require that the current clutch temperature be compared with a reference temperature. Rather, claims 1 and 17 require calculating a clutch temperature and comparing the calculated clutch temperature and a reference temperature. As noted in our findings above (FF6), Maguire does teach calculating an expected friction device temperature at the end of the shift and comparing that calculated temperature with a design limit (reference temperature).

Appellants present no other arguments against the rejection of claim 1 as being anticipated by Maguire. For the above reasons, Appellants' arguments fail to demonstrate error in the Examiner's rejection of claim 1.

Appellants also argue that Maguire does not teach a transfer case, as called for in claim 17. Appeal Br. 8. As noted in our findings above, according to Appellants' Specification, "[a] transfer case is a device located in a motor vehicle drive line between the output of a geared power transmission and front and rear driveshafts for transmitting power to the wheels." FF7. While claim 17 does not require any particular positioning of the transfer case relative to other components of a vehicle, claim 17 does require a clutch control system "[i]n a transfer case having first and second outputs," thereby providing some context for the term "transfer case." As noted in our findings above (FF3), Maguire does not explicitly teach a transmission having first and second outputs. Nor does the Examiner provide any explanation as to how Maguire satisfies this limitation. Accordingly, Appellants' argument demonstrates error in the rejection of claim 17, and claims 18 and 19 depending from claim 17.

The Obviousness Rejection

Appellants do not present any separate arguments for the patentability of claims 4 and 5 apart from independent claim 1, from which they depend. Therefore, in accordance with 37 C.F.R. § 41.37(c)(1)(vii), claims 4 and 5 stand or fall with representative claim 1.

The Examiner's position in rejecting claim 1 is that it would have been obvious to implement the clutch temperature limit control as taught by Maguire within the clutch temperature monitoring and actuating system of

Salecker because both are directed to monitoring clutch temperature as it relates to torque transmission through a slipping clutch arrangement and both act to prevent excessive heat related stressing by limiting or eliminating clutch slip when temperatures warrant so as to operate the clutch at a reduced temperature. Answer 8. Appellants contend that no reason or motivation to combine Salecker and Maguire is articulated by the Examiner or taught in the references. Appeal Br. 11-12. Appellants also argue that, even if combined, Salecker and Maguire do not teach all elements of the claims.

Specifically, Appellants argue that neither Salecker nor Maguire teaches increasing the degree of clutch engagement sufficiently to reduce the calculated temperature of the clutch, if the calculated clutch temperature equals or exceeds the reference clutch temperature (Appeal Br. 12), and mutually comparing the current clutch temperature and a reference temperature (Appeal Br. 13). As discussed above with respect to the anticipation rejection of claim 1, we find that Maguire teaches increasing the degree of clutch engagement sufficiently to reduce the calculated temperature of the clutch, if the calculated clutch temperature equals or exceeds the reference clutch temperature. Appellants' argument that neither Salecker nor Maguire teaches this feature thus is not persuasive. Appellants also argue that Salecker and Maguire do not teach the specific limitations recited in claims 2, 3, and 6-9, and a transfer case, as called for in claim 17. Appeal Br. 13-19.

Accordingly, the additional issues for our consideration in deciding the appeal of the obviousness rejection are:

(1) Do Appellants demonstrate error in the rejection of claim 1 as being unpatentable over Salecker and Maguire? This issue turns on whether (a) it would have been obvious to combine the teachings of Maguire of increasing the degree of clutch engagement sufficiently to reduce the calculated temperature of the clutch, if the calculated clutch temperature equals or exceeds the reference clutch temperature, with Salecker's automated clutch actuating apparatus, and (b) either Maguire or Salecker teaches comparing a calculated clutch temperature and a reference temperature.

(2) Do Appellants' arguments demonstrate error in the rejections of claims 2, 3, and 6-9 as being unpatentable over Salecker and Maguire? This issue turns on whether the Examiner has adequately explained where the limitations recited in these dependent claims are taught in either Salecker or Maguire or why it would have been obvious to a person of ordinary skill in the art to incorporate them in a clutch control system of the type taught by Salecker and Maguire.

(3) Does Appellants' argument that neither Salecker nor Maguire teaches a transfer case demonstrate error in the Examiner's rejection of claim 17 as being unpatentable over Salecker and Maguire?

Additional Facts Pertinent to the Obviousness Rejection

FF8 Salecker discloses an actuating apparatus or actor 15 or control unit 113 for controlling engagement and disengagement of a friction clutch 103 (torque transmitting system 3) in a transmission 4 or 104. The transmission has an input from the prime mover 2, 102, such as an engine, and an output axle or shaft 5, 105, which transmits torque to

the drive wheels via an axle 106 or a differential 6 and two drive shafts. Salecker, col. 4, ll. 44-55; col. 5, ll. 33-42; col. 6, ll. 47-48; figs. 1 and 2. Salecker describes only a single output from the transmission 4 or 104.

FF9 The actor 15 or control unit 113 comprises an electric motor 19 or 112, which actuates piston 20 of a master cylinder 16 or 111 to engage and disengage the clutch by way of pressurized fluid conduit 17 or 109 and slave cylinder 18 or 110. Salecker, col. 4, ll. 55-62; col. 6, ll. 47-67. The actor 15 or control unit 113 further includes electronics for controlling the actor. Salecker, col. 4, ll. 63-65; col. 6, ll. 47-49.

FF10 Salecker teaches that clutch slip results in kinetic energy of rotation, which is converted to friction heat, which in turn can lead to overheating of the friction surfaces of the clutch and possibly to destruction of the friction surfaces or even the entire clutch. Salecker, col. 5, l. 66 to col. 6, l. 11.

FF11 Salecker's control unit 113 ascertains, calculates, and/or determines whether or not an excessive slip exists and initiates and/or carries out undertakings to prevent an excessive stressing and/or destruction of the torque transmitting system. Salecker, col. 9, ll. 25-35. Such a determination involves the iterative calculation of anticipated temperatures of components of the friction clutch on the basis of signals from sensors, such as a shifting intent sensor, an RPM sensor, and a throttle valve sensor. Salecker, col. 3, ll. 6-8; col. 5, ll. 1-11; col. 7, l. 66 to col. 8, l. 10.

FF12 Salecker calculates the temperatures using equations which determine and take into account heat capacities or thermal masses of the

component parts of interest. *See* Salecker, col. 3, ll. 9-44; col. 9, l. 36 to col. 15, l. 14; figs. 5-7.

FF13 Salecker teaches that when the calculated temperatures reach or exceed a threshold value, it is possible to make adjustments to the transmission or the torque transmitting system to ameliorate or remedy the situation. Salecker, col. 15, ll. 27-32.

FF14 The Examiner finds that Salecker does not explicitly teach increasing the degree of clutch engagement sufficiently to reduce the calculated temperature of the clutch when a calculated clutch temperature equals or exceeds a reference clutch temperature. Answer 7.

FF15 Salecker teaches that the setting of the electric motor 112 determines the degree of engagement of the clutch. Salecker, col. 8, ll. 49-67.

Analysis

As shown in our findings above (FF11), Salecker teaches iteratively calculating anticipated temperatures of components of the friction clutch on the basis of signals from sensors, such as a shifting intent sensor, an RPM sensor, and a throttle valve sensor. Maguire likewise teaches calculating an expected friction device temperature at the end of the shift and comparing that calculated temperature with a design limit (reference temperature). Thus, both Salecker and Maguire satisfy the claim imitations of calculating a temperature of the clutch and comparing the calculated clutch temperature and a reference clutch temperature. Appellants' argument directed to the comparison of a clutch temperature and a reference temperature thus is not persuasive.

We turn now to the issue of whether it would have been obvious to combine Salecker and Maguire as proposed by the Examiner. While the requirement of demonstrating a teaching, suggestion, or motivation to combine known elements in order to show that the combination is obvious may be "a helpful insight," it cannot be used as a rigid and mandatory formula. *KSR Int'l. Co. v. Teleflex Inc.*, 550 U.S. 398, ___, 127 S. Ct. 1727, 1741 (2007). Further, while there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness, "the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *Id.*

As shown in our findings above, Salecker and Maguire both disclose control systems for controlling the engagement and disengagement of clutches in transmissions. FF1, FF5, FF8, FF9. Moreover, both references teach monitoring and calculating clutch, or clutch component, temperatures and taking adaptive measures in the operation of the clutch if it is determined that the clutch temperature would otherwise exceed a predetermined threshold or design limit. FF6 and FF11. Salecker also teaches making adjustments in the clutch operation when the calculated temperatures reach or exceed a threshold value. FF13. Although Salecker does not explicitly state what those adjustments might entail, Salecker does teach using an electric motor to control the degree of engagement of the clutch. FF15. The Examiner finds that Salecker does not explicitly teach the adaptive measure called for in claim 1, namely, increasing the degree of clutch engagement sufficiently to reduce the calculated temperature of the

clutch when a calculated clutch temperature equals or exceeds a reference clutch temperature. Maguire, however, teaches this approach, as explained in our discussion of the anticipation rejection of claim 1 above. To utilize the approach taught by Maguire in combination with the temperature calculating and clutch actuating method and system of Salecker is nothing more than the mere application of a known technique to a piece of art ready for the improvement, or the substitution of one element for another known in the field. *See Id.* at ___, 127 S. Ct. at 1740. "One of the ways in which [claimed] subject matter can be proved obvious is by noting that there existed at the time of invention a known problem for which there was an obvious solution encompassed by the [claims]." *Id.* at ___, 127 S. Ct. at 1742. In this case, both Salecker and Maguire evidence that the overheating of clutch components due to clutch slip was a well known problem in the art at the time of Appellants' invention. FF3 and FF10. Moreover, Maguire evidences that the technique of increasing the degree of clutch engagement sufficiently to reduce the calculated temperature of the clutch when a calculated clutch temperature equals or exceeds a reference clutch temperature was a known solution to that recognized problem. Appellants fail to persuade us of error in the Examiner's proposed combination of Salecker and Maguire.

For the above reasons, Appellants' arguments do not demonstrate error in the Examiner's rejection of claim 1 as being unpatentable over Salecker and Maguire.

Appellants argue that the portions of Salecker relied upon by the Examiner in rejecting claim 2 do not teach the specific method steps recited in claim 2. Appeal Br. 14. We agree with Appellants. On page 8 of the

Answer, the Examiner cites column 8, lines 49-67 and column 9, lines 25-35 of Salecker as teaching clutch slip adjustment for torque transmission while limiting excessive clutch slip, but does not explain how the specific steps recited in claim 2 are taught therein. As noted in our findings above, these two portions of Salecker teach that the setting of the electric motor 112 determines the degree of engagement of the clutch (FF15) and that the control unit 113 ascertains, calculates, and/or determines whether or not an excessive slip exists and initiates and/or carries out undertakings to prevent an excessive stressing and/or destruction of the torque transmitting system (FF11). Appellants' argument demonstrates error in the Examiner's rejection.

Appellants argue that neither Salecker nor Maguire discloses that the step of increasing the degree of clutch engagement over a period sufficient to reduce the calculated temperature of the clutch includes the step of fully engaging the clutch, as called for in claim 3. Appeal Br. 14. This argument does not address the Examiner's position, as stated on page 8 of the Answer, that it would have been obvious to a person of ordinary skill in the clutch control art that clutch slip is eliminated when the clutch is fully engaged. This argument also overlooks Maguire's teaching that friction resulting from clutch slip (relative slipping between discs) during the slipping portion of the engagement cycle causes an increase in disc temperature and Maguire's teaching of cooling the discs by fluid flow when the discs are completely engaged or disengaged. FF4. A person of ordinary skill in the art would understand from these teachings that Maguire contemplates fully engaging the clutch at one end of the engagement cycle and fully disengaging the clutch at the other end of the cycle. The person of ordinary skill in the art

would further appreciate that slip occurs on route to and from the fully engaged and disengaged states, but not in the fully engaged and disengaged states. Accordingly, Maguire fairly suggests fully engaging the clutch, thereby eliminating the clutch slip, to reduce the temperature of the clutch. Appellants' argument fails to demonstrate error in the Examiner's rejection of claim 3.

We agree with Appellants (Appeal Br. 16-18) that the Examiner has not pointed out where each and every one of the specific method steps recited in claims 6-8 is taught or suggested by Salecker or Maguire. While the Examiner points to portions of Maguire as purportedly satisfying the limitations of claims 6, 7, and 8 (Answer 9), the Examiner has not adequately explained, nor is it immediately apparent to us, where each of the recited steps is taught in the portions of Maguire alluded to by the Examiner. Appellants' arguments thus demonstrate that the Examiner fails to establish a prima facie case of obviousness of the subject matter of these claims.

Claim 9 requires establishing a threshold clutch temperature that is higher than the reference temperature and fully engaging the clutch if the calculated clutch temperature equals or exceeds the threshold clutch temperature. Appellants argue that the Examiner has not pointed to any teachings in the prior art reference to justify the conclusion that these steps would have been obvious. Appeal Br. 18. We agree with Appellants. While the Examiner addresses the limitation of fully engaging the clutch once it is determined that the clutch temperature is higher than a reference or limit value (Answer 9), the Examiner does not point to any teaching in either Salecker or Maguire, or articulate any reason with rational underpinning as to why it would have been obvious, to establish a threshold clutch

temperature that is higher than a reference temperature and to fully engage the clutch upon a determination that the calculated clutch temperature exceeds that higher threshold temperature. Appellants thus demonstrate that the Examiner fails to establish a prima facie case of obviousness of the subject matter of claim 9.

Appellants also argue that Maguire does not teach a transfer case, as called for in claim 17. Appeal Br. 19. According to Appellants, "[a] transfer case is a device located in a motor vehicle drive line between the output of a geared power transmission and front and rear driveshafts for transmitting power to the wheels." FF7. While claim 17 does not require any particular positioning of the transfer case relative to other components of a vehicle, claim 17 does require a clutch control system "[i]n a transfer case having first and second outputs," thereby providing some context for the term "transfer case." As noted in our findings above, neither Maguire nor Salecker explicitly teaches a transmission having first and second outputs. FF3 and FF8. Nor does the Examiner provide any explanation as to how the combination of Salecker and Maguire satisfies this limitation or why it would have been obvious to provide such a transfer case in the combined system. Accordingly, Appellants' argument demonstrates error in the rejection of claim 17, and claims 18 and 19 depending from claim 17.

CONCLUSIONS OF LAW

Maguire teaches increasing the degree of clutch engagement sufficiently to reduce the calculated temperature of the clutch, if the calculated clutch temperature equals or exceeds the reference clutch temperature, as called for in independent claims 1 and 17. Maguire also

teaches comparing a calculated clutch temperature with a reference temperature. Therefore, Appellants fail to demonstrate error in the Examiner's rejection of claim 1 as being anticipated by Maguire.

Maguire does not disclose a transfer case, as called for in claim 17. Appellants thus demonstrate error in the Examiner's rejection of claim 17, and claims 18 and 19 depending from claim 17, as being anticipated by Maguire.

Appellants fail to demonstrate error in the Examiner's determination that it would have been obvious to combine the teachings of Maguire of increasing the degree of clutch engagement sufficiently to reduce the calculated temperature of the clutch, if the calculated clutch temperature equals or exceeds the reference clutch temperature, with Salecker's automated clutch actuating apparatus. Appellants also fail to demonstrate that neither Maguire nor Salecker teaches comparing a calculated clutch temperature and a reference temperature and increasing the degree of clutch engagement sufficiently to reduce the calculated temperature of the clutch, if the calculated clutch temperature equals or exceeds the reference clutch temperature, as called for in claims 1 and 17. However, neither Maguire nor Salecker discloses a transfer case, as called for in claim 17. In light of the above, Appellants fail to demonstrate error in the Examiner's rejection of claims 1, 4, and 5 as being unpatentable over Salecker and Maguire. Appellants do demonstrate error in the rejection of claim 17 as being unpatentable over Salecker and Maguire.

Appellants fail to demonstrate error in the rejection of claim 3 as being unpatentable over Salecker and Maguire.

Appellants demonstrate error in the rejection of claims 2 and 6-9 as being unpatentable over Salecker and Maguire.

DECISION

The Examiner's decision is affirmed as to claims 1 and 3-5 and reversed as to claims 2, 6-9, and 17-19.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv) (2007).

AFFIRMED-IN-PART

vsh

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